AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (currently amended) An organic contaminant molecule sensor for use in a low oxygen concentration monitored environment~~, the sensor~~ comprising:

an electrochemical cell comprising:

a solid state oxygen anion conductor in which oxygen anion conduction occurs at or above a critical temperature T_c~~,~~;

an active measurement electrode formed on a first surface of the conductor for exposure to the monitored environment, the measurement electrode comprising material for ~~catalysing~~ catalyzing the oxidation of an organic contaminant molecule to carbon dioxide and water~~,~~;

an inert measurement electrode~~,~~ formed on the first surface of the conductor adjacent to and independent from the active measurement electrode~~,~~ for exposure to the monitored environment, the inert measurement electrode comprising material that is catalytically inert to the oxidation of an organic contaminant molecule~~,~~; and

a reference electrode formed on a second surface of the conductor for exposure to a reference environment, the reference electrode comprising material for ~~catalysing~~ catalyzing the dissociative adsorption of oxygen;

means for controlling and monitoring the temperature of the cell;

means for controlling the electrical current I_a flowing between the reference electrode and the active measurement electrode and the electrical current I_i flowing between the reference electrode and the inert measurement electrode~~,~~ ~~thereby~~ to control the flux of oxygen anions flowing between the reference electrode and the active and inert measurement electrodes respectively; and

means for monitoring the potential difference between the active measurement electrode and the inert electrode, ~~whereby~~ wherein in the absence of organic contaminant molecules the potential difference V_{sense} between the active and inert measurement electrodes assumes a base value V_b and in the presence of organic contaminant molecules the potential difference V_{sense} between the active and inert measurement electrodes assumes a measurement value V_m, the value $V_m - V_b$ being indicative of the concentration of organic contaminant molecules present in the monitored environment.

2. (currently amended) The~~A~~ sensor according to Claim 1~~,~~ wherein the active measurement electrode is coated with or formed from ~~material~~ a metal selected from the group of metals ~~comprising~~ consisting of rhenium, osmium, iridium, ruthenium, rhodium, platinum, ~~and~~ palladium and alloys thereof.

3. (currently amended) The~~A~~ sensor according to Claim 2~~,~~ wherein the alloys include one or more elements selected from the group of elements consisting of silver, gold and copper.

4. (currently amended) The~~A~~ sensor according to ~~any of~~ Claims 1 ~~to 3,~~ wherein the reference electrode is formed from a material able to ~~catalyse~~ catalyze the dissociation of oxygen.

5. (currently amended) The~~A~~ sensor according to Claim 4~~,~~ wherein the reference electrode is formed from platinum, palladium or other metal able to dissociatively adsorb oxygen or any alloy thereof.

6. (currently amended) The~~A~~ sensor according to ~~any preceding c~~Claim 1~~,~~ wherein the solid state oxygen anion conductor ~~is~~ comprises a compound selected from the group of compounds consisting of gadolinium doped ceria and yttria ~~stabilised~~ stabilized zirconia.

7. (currently amended) The~~A~~ sensor according to ~~any preceding c~~Claim 1~~,~~ comprising a counter electrode positioned adjacent to the reference electrode.

8. (currently amended) TheA sensor according to Claim 7, wherein the counter electrode is formed from platinum, palladium or other metal able to dissociatively adsorb oxygen.

9. (currently amended) TheA sensor according to ~~any preceding c~~Claim 1, wherein the reference environment is a gaseous source of oxygen.

10. (currently amended) TheA sensor according to ~~any of~~ Claims 1 ~~to 8~~, wherein the reference environment comprises a solid-state source of oxygen.

11. (currently amended) TheA sensor according to Claim 10, wherein the solid state source ~~is selected from~~comprises a metal-/-metal oxide couple (optionally Cu / Cu_2O or Pd / PdO), or a metal oxide-/metal oxide couple (optionally Cu_2O / CuO).

12. (currently amended) TheA sensor according to ~~any preceding c~~Claim 1, wherein the means for controlling or monitoring the temperature of the cell comprises a heater and thermocouple arrangement.

13. (currently amended) Use of a sensor according to ~~any preceding c~~Claim 1 for monitoring the levels of trace organic contaminants in a low oxygen concentration monitored process environment.

14. (currently amended) A method of monitoring the levels of trace organic contaminants in a monitored process environment, the method comprising the steps of:

providing an electrochemical sensor comprising:

a solid state oxygen anion conductor in which oxygen anion conduction occurs at or above a critical temperature T_c,;

an active measurement electrode formed on a first surface of the conductor for exposure to the monitored environment, the measurement electrode comprising material for ~~catalysing~~ catalyzing the oxidation of an organic contaminant molecule to carbon dioxide and water,;

an inert measurement electrode~~,~~ formed on the first surface of the conductor adjacent to and independent from the active measurement electrode~~,~~ for exposure to the monitored environment, the inert measurement electrode comprising material that is catalytically inert to the oxidation of an organic contaminant molecule~~,~~; and

a reference electrode formed on a second surface of the conductor for exposure to a reference environment, the reference electrode comprising material for ~~catalysing~~ catalyzing the dissociative adsorption of oxygen;

raising the temperature of the cell above the critical temperature T_c;

passing an electrical current I_a between the reference electrode and the active measurement electrode and a electrical current I_i between the reference electrode and the inert measurement electrode~~, thereby~~ to control the flux of oxygen anions flowing between the reference electrode and the active and inert measurement electrodes respectively; and

monitoring the potential difference between the active measurement electrode and the inert electrode~~, whereby~~ so that in the absence of organic contaminant molecules the potential difference V_{sense} between the active and inert measurement electrodes assumes a base value V_b and in the presence of organic contaminant molecules the potential difference V_{sense} between the active and inert measurement electrodes assumes a measurement value V_m, the value $V_m - V_b$ being indicative of the concentration of organic contaminant molecules present in the monitored environment.

15. (currently amended) The~~A~~ method according to Claim 14~~,~~ wherein I_a is in the range from 10nA to 100μA.

16. (currently amended) The~~A~~ method according to Claim 14~~ or Claim 15,~~ wherein the sensor is provided with a counter electrode adjacent the reference electrode.

17. (currently amended) The~~A~~ method according to ~~any of~~ Claim~~s~~ 14~~ to 16,~~ wherein

the reference environment is a gaseous source of oxygen at atmospheric pressure, preferably atmospheric air.

18. (currently amended) TheA method according to ~~any of~~ Claims 14 ~~to 16,~~ wherein the reference environment comprises a solid-state source of oxygen.

19. (currently amended) TheA method according to Claim 18~~,~~ wherein the solid state source ~~is selected from~~comprises a metal-/-metal oxide couple (optionally Cu / Cu_2O or Pd / PdO), or a metal oxide-/metal oxide couple (optionally Cu_2O / CuO).

20. (currently amended) An organic contaminant molecule sensor for use in a low oxygen concentration monitored environment~~, the sensor~~ comprising:

an electrochemical cell comprising:

an oxygen anion conductor in which oxygen anion conduction occurs at or above a critical temperature T_c~~,~~;

an active measurement electrode in contact with the conductor for exposure to the monitored environment, the measurement electrode comprising material for ~~catalysing~~ catalyzing the oxidation of an organic contaminant molecule to carbon dioxide and water~~,~~;

an inert measurement electrode~~,~~ in contact with the conductor independent from the active measurement electrode~~,~~ for exposure to the monitored environment, the inert measurement electrode comprising material that is catalytically inert to the oxidation of an organic contaminant molecule~~,~~; and

a reference electrode in contact with the conductor for exposure to a reference environment, the reference electrode comprising material for ~~catalysing~~ catalyzing the dissociative adsorption of oxygen;

means for controlling and monitoring the temperature of the cell;

means for controlling the electrical current I_a flowing between the reference electrode and the active measurement electrode and the electrical current I_i flowing between the reference electrode and the inert measurement electrode~~,~~ ~~thereby~~ to control the flux of oxygen anions flowing between the reference

electrode and the active and inert measurement electrodes respectively such that the NEMCA effect is activated; and

means for monitoring the potential difference between the active measurement electrode and the inert electrode~~, whereby~~ so that in the absence of organic contaminant molecules the potential difference V_{sense} between the active and inert measurement electrodes assumes a base value V_b and in the presence of organic contaminant molecules the potential difference V_{sense} between the active and inert measurement electrodes assumes a measurement value V_m, the value $V_m - V_b$ being indicative of the concentration of organic contaminant molecules present in the monitored environment.